THE ORIGIN OF INTEREST

THE brilliant work of Professor v. Böhm-Bawerk, *The Positive Theory of Capital*, has defined two issues that will have to be decided. Is interest a product of capital or is it not? Is capital to be studied in its entirety, as a permanent agent of production, or are the producers' goods that constitute it to be studied only in detail? In the common and practical sense of the term, capital is an abiding fund of wealth employed in production. In successful industry it never perishes, though the substance of it changes its identity. The tools and materials that are in use to-day will not be in use for many years. Some of them will go out of use to-morrow, and will be replaced by other tools and materials. The material tissue of social capital is undergoing continual change, like the substance of a living organism; but the productive fund as a whole may be said to keep its identity. It continues unimpaired through the changes that affect its separate tissues. A successful man of business keeps his capital; but for the sake of success he must continually part with capital goods. Shall we study the permanent total or only the perishable component elements?

Capital acts continuously and without periods, while each particular instrument has a beginning and an end. The economic career of any particular bit of matter that enters into a tool or usable commodity measures a more or less distinguishable interval of time. When capital goods are studied, these periods come into view as elements to be considered. In the theory of Professor v. Böhm-Bawerk they are the cardinal facts on which the returns from capital are based. Interest is a premium on goods that are available for use at the beginning of such periods, as compared with the goods that are available at the end.

He has given us a fascinating time discount theory of interest; and the time is defined by the economic career of instruments of production.

The issue is not whether concrete capital goods are or are not to be studied at all. For certain purposes they have to be studied. The question is whether, in addition to this attention given to the perishable goods, the permanent fund of capital is to be studied in its entirety. Is the problem of accounting for the current rate of interest anything else than the problem of discovering why a certain permanent fund of producers' wealth annually creates and secures for its owners an income that is equal to a certain fraction of the fund itself? If this is true, the conception of capital as a permanent thing, existing and acting in its entirety, is introduced in the statement of the interest problem.

On the one side, then, we have a theory that studies only concrete instruments. It measures the period that their action defines, and reduces interest to an *agio* due to the particular intervals of time that are thus measured. On the other side we have a theory that recognizes these instruments and their qualities, but gives a cardinal place to the study of that permanent capital which the endless succession of instruments constitutes. It defines the interest problem in terms of that fund, and makes the rate to be the fraction of itself that the fund annually creates. It is a productivity theory; and it relegates the separate periods of production to a subordinate place.

The dialectical issue is a sharp one, and there is a question of fact involved. In an article in the *Yale Review* for November, 1893, I expressed the opinion that the abandonment of permanent capital as a subject of study is a departing from the line that leads directly to the goal in view. By the attractive quality of his work Professor v. Böhm-Bawerk has drawn many students after him upon what I ventured to call a scientific side-track. I did,

however, express the opinion that, if this track be followed far enough, it will bring the traveller again to the main line. It is the significance of this second assertion that I wish now to point out. What it means is that the study of concrete capital goods cannot be complete unless it becomes a study of permanent capital. I claim also that it affords a productivity theory of interest.

The periods of production that figure in Professor v. Böhm-Bawerk's analysis cannot have the importance that he has attributed to them unless there are in society persons who must wait through such intervals in order to have their wants gratified. If there were a class of persons who could be correctly pictured as standing at the beginning of the period marked by the life of some instrument of production, looking forward to the end of the interval, and knowing that their wants could, in the natural course of industry, only be gratified at the end, then there would be a class on whom this interval of waiting would impose a certain burden. If they waited through the period in order that the products of their industry might mature, they would themselves feel the burden of the delay. They would undergo what may be called a time sacrifice. If they were unable personally to undergo this sacrifice, and if, therefore, they avoided it by inducing others to endure it for them, the burden of waiting through the interval would still have to be carried by some one. Some class of social producers would, for a consideration, thrust an interval of time between wants and satisfactions. In the study of Professor v. Böhm-Bawerk loan interest is the consideration for this. It is a payment for vicarious waiting.

Interest is a static income. This means that the existence of it does not depend on social progress. Changes for the better in the industrial system react on the rate of interest, as they do on other shares in distribution; but they are not necessary in order that this income may exist.

Methods of production might remain unchanged, and the form of society might be, as it were, frozen into fixity; and yet capital would do its work and earn its pay. Interest is to be accounted for by a cause that would act in a static society, if such an organism existed. In dynamic societies this income is due to static causes. It is not contingent on progress.

If a time sacrifice, or a sacrifice entailed by merely waiting for something, is at the basis of interest, it must be one that would be incurred under static conditions. If the periods referred to cause the time sacrifice that lies back of interest, then waiting through these particular periods must be a cardinal fact in static industry. There must be actual persons somewhere who might have had things at the beginning of such a period, who do get them at the end, and who demand and get pay for this waiting. In the article referred to I have claimed that such time sacrifice as this has no existence. Nowhere in society can we find men who incur it. Every one gets finished goods to-day as a consequence of the work of to-day. "To-day we work, and to-day we eat; and the eating is the consequence of the working." Moreover, a worker's immediate eating is not secured by making other persons wait through one of these intervals. A laborer does not do this kind of waiting himself, and he does not do it by proxy. Interest accrues daily, like wages, as industry proceeds, and as the product of capital is created. The finished goods that the capitalist desires for use he gets as his capital virtually creates them. Production and its returns are synchronous.

Creating new capital is not a part of the process by which interest is secured. All that is needed is that existing capital should be properly used. It might conceivably be that for several generations no one would do more than to preserve unimpaired the capital handed down to him. In that case there would be no true abstinence practised.

A static condition excludes abstinence, but admits of the earning of interest. If permanent capital has once been created, the income from it may be enjoyed without further time sacrifice of any kind.

It is not a simple study that will reveal the whole relation between Professor v. Böhm-Bawerk's theory of goods and a theory based on the productivity of permanent capital. It involves close analysis, and may make demands on the reader's patience. It ends by showing how a study of concrete goods, with their periods of production, must, in order to be true, translate itself into a study of permanent capital.

In the article in the *Yale Review* already referred to I criticised a formula used by Professor v. Böhm-Bawerk. "As a rule, present goods have a higher subjective value than future goods of like kind and number." * A certain controversy has ensued on the subject of formulas. The one just quoted contains the germ of Professor v. Böhm-Bawerk's theory. I have claimed that no one has to wait for his income through the so-called periods of production, so that, in connection with them, this comparison of present and future does not need to be made at all. It is made only in connection with the creation of new capital. In deciding to "save" wealth rather than to spend it, a capitalist looks forward to the unending series of accretions of interest, and sets a subjective value on them. The remoteness of most of them in time is one fact to be considered. The kind of enjoyments that they will bring to him is another element; and, in fact, they will bring enjoyments quite different from those that were, by the act of abstinence, relinquished. The man does not compare present goods with future goods of like kind and number.

If the man who saves capital foregoes a pleasure and gets, at some future time, a similar pleasure, then the

* *The Positive Theory of Capital*, pp. 247–249.

effect of the delay is, in his calculation, isolated and measured. In fact, it never is thus isolated. There is no economic person who has occasion to calculate an *agio* that is due to mere time. The man who saves capital does not do it, since he foregoes certain enjoyments and gets others. In a static condition no consumer computes the present worth of future goods at all, since in that state there is no abstinence.

In his recent article in this journal Professor v. Böhm-Bawerk says that the object of the formula is to express "the superiority which difference of time gives present over future goods. Now, every one will admit that the circumstances of present diamonds, for example, being worth more than future pebbles, has as little to do with this superiority as has the circumstance that *two thousand* present dollars are worth more than one thousand future dollars. On the other hand, this superiority is most nicely tested and expressed in the statement that one thousand present dollars are worth more than one thousand future dollars, or that ten present tons of iron are worth more than ten future tons of iron." *

If the object of the study be to isolate the single element, time, I should say that a comparison of one thousand present dollars with one thousand future dollars is inherently incapable of accomplishing the purpose in view. This sum in the present will buy certain things, and a like sum hereafter will buy different things. The superiority of the present over the future is not what it would be if only the lapse of time were to be considered. If the capitalist's forward glance, at the moment at which he is deciding how much capital to save, has the effect of fixing the amount of capital and thereby influencing the rate of interest, that rate is not what it would be if the capitalist were comparing personal gains alike in kind and in amount. Interest is not, as a mathematical

* *Quarterly Journal of Economics* for January, 1895, p. 119.

fact, an equivalent offset for the sacrifice entailed by mere delay.

If, now, I have misunderstood the theory of my honored opponent in this discussion, by assuming that he intends in this absolute way to isolate the effect of mere futurity, and to make that alone the basis of interest, then the question of the accuracy of his formula is the one to be considered. We agree as to the nature of the capitalist's act. In Professor v. Böhm-Bawerk's article now cited it is claimed that the capitalist does what the formula describes. He compares present and future goods of like kind and number, because he compares present dollars with future ones.

In my view, the formula is not saved by introducing money as the thing to be measured. On the contrary, the entire question concerning formulas appears to me to be surrendered by doing this. The thing to be measured is "subjective value"; and money in itself does not possess that quality at all. The capitalist does indeed measure a subjective value that is closely connected with money. It resides in the goods that the money will buy; and the moment that we introduce these we have unlike articles for appraisal.

Again, the man who "saves" his income does not forego the use of money in the present. He gets his income in that form, and spends it for capital goods rather than for consumers' goods. What he does with his money may actually present the case of present diamonds and future pebbles. He estimates the subjective value of the diamonds that he might have bought, and then calculates the present subjective value of the endless series of pebbles and other things that he will buy with his accruing interest. He compares two different subjective values, obtainable by different modes of spending present money. Comparing present and future money,—if we do not so translate the term as to make it mean goods,—is not com-

paring subjective values at all. If we do so translate the term, we find ourselves comparing unlike goods, and ceasing to measure the effect of mere futurity.

In still another way my honored opponent's introduction of money into the problem seems to me to tell against his position. In comparing sums of money, present and future, we are actually comparing what I have called "sums" or "quantities of wealth" present and future. My critic objects to these terms, as vague, and is of the opinion that, in defining them, I shall be compelled either to adopt his formula concerning goods of like kind and number or to give to the terms a meaning that is false. I submit, however, that in saying that a capitalist compares a present sum of money with an equal future sum, for the purpose of measuring a subjective value, he admits that what the man really estimates is like quantities of wealth measurable in money. The "money" of his formula is the "sum of wealth" of mine. We might even say that the capitalist compares pecuniary values present and future. As both agree, the things to be compared are a dollar's worth of whatever-you-please obtainable now and a dollar's worth of whatever-you-please obtainable hereafter.

We have only to give precision of meaning to the term "money" in another connection to have the conception of capital that I have endeavored to define and use. If a corporation reports its capital as consisting in "a million dollars," what it means is that it has, as a perpetual possession, a million dollars' worth of producers' wealth. The capital goods that constitute this sum are forever changing their identity; but the sum of a "million dollars" abides.

If this conception were mystical as my eminent critic thinks, the practical world would not use it. If it were a conception of capital "distinct from concrete goods of which capital, in fact, consists," scientific usage would

have to reject it. Science inevitably adopts this conception when it speaks of capital as "permanent" or as "mobile." Capital goods have neither of these qualities. Instruments as such do not last forever, and they cannot be moved with much freedom from one industry to another. A whaling ship cannot be made to spin cotton; but capital has, in fact, transferred itself from the whale fishery of New England to cotton spinning. Ships were allowed to decay, and mills were built in place of them. Mobility is an attribute of the capital of which I have treated. You can get "money" out of one industry, and put it into another. Interest is the annual return from this permanent and mobile money, or, more accurately, from this monetary value in changeable capital goods.

Formulas are of less importance than facts. An issue of fact is raised when we inquire whether the waiting that the capitalist does connects itself with the periods of production referred to early in this paper.

I have undertaken to make good the following claims: —

(1) In static conditions the periods of production that are marked by the life of particular instruments of production do not involve delayed enjoyment.

(2) Waiting, as an economic function, is wholly concentrated into the abstinence by which permanent capital is created.

(3) In this act certain enjoyments are not merely deferred, but are forever surrendered, and an unending series of different enjoyments is secured.

In testing these theses we shall determine in how far Professor v. Böhm-Bawerk is correct in claiming that the sacrifice by which a capitalist earns his income consists in mere waiting, and whether this waiting is limited by the periods of production above referred to.

A more important test is to follow. The waiting must be futile unless, in some way, it brings into existence more goods than could be created without it. Time must

be productive of commodities. In Professor v. Böhm-Bawerk's theory it is thus productive. Lengthening the periods referred to increases the output of goods. As we lengthen them more and more, the increase in the output continues, but the rate of increase diminishes. The later extensions of the intervals that, in the theory, are said to separate labor and its reward, add less to the fruits of industry than do the earlier intervals so interposed. Time, as a productive element, is governed by the law of diminishing returns.

What if the time that is measured by these intervals is not necessarily productive? If it is practicable to lengthen or shorten these periods without affecting the product of industry at all, then the objective effect attributed to them vanishes. Their length is not necessarily connected with the quantity of goods that industry creates.

If we establish the claim last made, we shall prove that the objective effects attributed to these intervals do not result from them. They may be lengthened or shortened without changing the productiveness of industry. Though it were at the cost of an analysis that would make large demands on the readers' patience, it would be necessary to decide these two issues. That time figures as an element in industry, and that it produces results both subjective and objective, is beyond question. The time that is required for the ripening of capital goods,— the specific intervals of time that are the subjects of Professor v. Böhm-Bawerk's study,— might be made longer without increasing any one's sacrifice and without adding to any one's gains. They might be made shorter without diminishing either the burdens or the fruits of industry.

Let us first test the power of the periods of production to impose sacrifices. Let us suppose that a forest twenty acres in extent suffices to furnish fire-wood for a family. A tree will mature in twenty years; and the forest must be kept intact, in point of size and maturity, or the sup-

ply of wood will fail. Each year we plant a row of trees along one side of the forest, and cut a row from the other. The planting and the cutting are, in a way, simultaneous. We do not burn to-day the tree that we plant to-day; but we do burn a tree the burning of which is made practicable by to-day's planting. The tree that is just set is the enabling cause of the consuming of the one that is twenty years old. To plant a sapling and wait for it to mature would be a slow way to make a fire; but to plant one, and *by means of this planting and of the maturing of the forest* to get at once another tree for use, is a quick way of making a fire. The forest is a synchronizer of labor and its virtual fruit.

The fact that is of practical consequence is that, if we have once secured the permanent forest, we have no waiting to do for fuel. The identity of the tree that we burn is of no consequence. To plant one and burn another that is at once made available in consequence of the planting of the one is to annihilate the interval that would have existed if it had been necessary to depend on one particular tree. Moreover, the rate at which trees grow is of no consequence, except as it fixes the size of the forest that we have to maintain. If one row of trees has to be cut each year, and if the trees mature in twenty years, then the forest must contain twenty rows in order to supply the demand that is made on it and to continue undiminished in size. If it takes forty years for the trees to grow to the point at which we cut them, the forest will have to contain forty rows. It will be twice as large as in the former case. If, however, the larger forest has once been secured, there is no waiting to be done in order to get those that have had forty years of growth. We continue the planting and the simultaneous cutting, as in the former case.

As affecting the amount of capital that has to be kept in the shape of a growing forest, the period defined by the

life of a tree has its only economic importance. The original raising of the forest entails a sacrifice. There is more abstaining to be done in order to get a large forest than is necessary in order to get a small one; but, when once the forest is secured, waiting is at an end.

The forest is a type of one kind of capital goods that figure in industry. All products are gradually matured; and it is necessary to maintain in constant existence a series of them in various stages of completion. We must have growing cattle, hides, tanned leather, partly made shoes and finished shoes, all maintained in a constant quantity, in order that a certain number of shoes may each day be taken for use; but, *if this series of capital goods is so maintained*, the ranchman, the tanner, and the shoemaker may all get finished shoes to-day in consequence of the work of to-day.

First day A A′ A″ A‴.

Second day A A′ A″ A‴ (former A‴ taken for the use of all producers).

Let the letters A A′ A″ A‴ in the upper horizontal line represent such a series of goods in various stages of completion. A is the raw material, and A‴ is the article ready for use. Each transformation is effected by a distinct group of workers. One set of men gets A out of the soil: another set transforms it into A′, etc. By the industry of all there is created each day enough of the article A‴ for all; and every man has his portion without waiting. At the end of the second day there is a new A in existence: the A of the previous evening has become A′, the A′ has become A″, and the A″ has become A‴. The A‴ of the first day is available to satisfy the wants of all; and it has become so by reason of the industry of all. We have added a member at the beginning of the line, taken away one at the end, and ripened the intervening members. All the groups have acted, and all have taken their pay.

It is, therefore, into the original creation of the first series of goods A, A′, A″, and A‴ that all the time sacrifice that industry involves is, as a practical fact, concentrated. In the further prosecution of the industry, waiting for the ripening of the particular goods is unnecessary; and the periods marked by such goods are, in this especial connection, unimportant.*

If enough capital has once been created, the length of the periods of production has no connection with the sacrifices entailed by industry. Production might go on forever, either by long periods or by short ones; and, if there is no new capital created, there is no time sacrifice incurred. This is equivalent to saying that interest can be earned under perfectly static conditions, and that in such conditions there is no incurring of time sacrifice. As bearing on the unfavorable subjective effects of industry, or the personal costs entailed by it, the length of the productive periods is, in the assumed conditions, unimportant.

We have next to test the objective effect of lengthening or shortening the periods, and must define these intervals carefully. What defines the period of production that is connected with a particular instrument? It comes gradually into existence, and it gradually perishes. It is not created by mere labor, but by labor aided by other instruments. These earlier appliances were created by still

*I understand that in the passage in his recent article that is found on pp. 123–125 of the *Quarterly Journal of Economics* for this year Professor v. Bohm-Bawerk frankly concedes that waiting for goods to ripen is not necessary in the case of laborers who produce raw materials. While that identical material is the direct product of such a man's labor, finished goods, which he gets in exchange, are, "in a certain but less literal sense, *also* the fruit of his labor." The issue would be reduced to mere dialectics if it were not for the differing ways in which we account for the absence of waiting. In Professor v. Bohm-Bawerk's theory the laborer avoids waiting by an exchange, in which some one else assumes that burden. In my view no one assumes it in static conditions. The only time sacrifice that can be detected is one that has been incurred, once for all, by the men who, in the past, created the capital that is now in existence. Granted that enough capital has once been brought into existence, the ripening period of capital goods may be long or short without affecting the sacrifices involved in production.

earlier ones. If we are to trace the origin of any goods to the earliest labor that has contributed to making them, we shall follow the series of instruments backward to a point at which no capital existed. In this strict sense, all of the periods of production have their beginnings at the beginning of civilization. Before "Adam delved and Eve span" there was performed the first labor that contributed to the making of the spades and the spindles that are now in use.

Again, instruments both directly and indirectly bring other instruments into existence. Tools, etc., do not ripen altogether into consumers' goods. Each implement helps, in some way, to create a successor in an endless series of implements. If we try to follow the effect of the action of a tool forward to a point at which consumers' goods, and these only, remain as a result of its action, we shall follow it forever without reaching what we seek. Productive periods begin with civilization, and never end. It is not possible to lengthen them. It is possible to multiply the number of capital goods that exist through parts of this endless period. In other words, it is possible to increase the quantity of capital in existence. The only practicable lengthening of the interval is really a multiplying of the goods existing within the interval. The time that figures in Professor v. Böhm-Bawerk's analysis translates itself into quantity. It affords one possible mode of expressing the amount of a permanent fund of capital.

The increase of this fund reveals the law of diminishing returns that Professor v. Böhm-Bawerk has attributed to increasing intervals of time. As the quantity of capital increases, the product of industry grows larger, but the *rate* of enlargement grows smaller. If the prolonging of periods really means an enlargement of capital, this law of diminishing returns will seem to be true of what is called time. It is, however, *because* this law of diminishing returns is true of capital that it seems to be true of

time. *It is only in cases in which time can be translated into quantity that the law is thus true.* Lengthen the periods of production without increasing the amount of capital, and the law will not hold true.

Instruments renew themselves in different ways. A few directly help to create similar instruments, while others accomplish this result indirectly. All of them, except economic land, do, in effect, create their own successors, since all taken together create, in addition to an income that is interest, new capital goods like themselves. The hoe does not, of itself alone, create another hoe; but all the hoes, looms, ships, engines, etc., in the world, taken collectively, create, in addition to the income they afford to their owners, new hoes, looms, ships, engines, etc.

In a static condition this self-renewal of capital goods, taken as a grand total, would be exact. The whole social equipment of them would pay an income to the capitalist class, and would exactly duplicate themselves, as they should pass off from the stage. There would be an uninterrupted series of exactly similar hoes, looms, ships, engines, etc. This is saying that there would be a permanent social fund of capital that would pay perpetual interest, and renew forever the waste of its own material tissues.

By the isolating method of study it is possible to test the effect of merely changing the length of different periods of production. Let us picture the cardinal features of a static society. Labor and capital remain unchanged in amount and kind. Processes undergo no variations. From year to year implements wear out, and give place to similar ones. There is a constant originating of capital goods; but there is no originating of capital, since every instrument that is made replaces one that is removed. There is no abstinence. There is one constant social agent,— labor; and there is another constant social

agent,— capital. The conditions of a static state demand that no unrestored waste of substance should take place in either, and that no increase of substance should take place. This means that population and capital goods remain unchanged in quantity.

Periods of production may be measured from the date at which the first and rawest material is prepared for the making of an instrument to the date at which that instrument ceases to act in production. The antecedents of an instrument stretching back to the beginning of civilization may, for present purposes, be disregarded. They measure a quantity that is uniform for all capital goods. The series of other instruments that will follow the present ones may also be disregarded. The variable part of the interval connected with the economic life of an instrument is marked by the beginning of the process of directly making it and the end of its own directly productive action. The beginning is at the point at which labor and capital begin to fashion material for it; and the end is when it wholly ceases itself to produce other goods.

In a static condition instruments are continually made; but the making of them does not defer the enjoyments of either the makers or the purchasers and users of them. Here is a loom in operation. It is wearing itself out in weaving cloth. For every flight of its shuttle there is more cloth in existence, and there is a less perfect loom. If we reduce the illustration to the simplest terms, we may say that some of this cloth is going each day to loom-makers, who build a new machine, *pari passu*, as the old one wears out. Some of the cloth goes to the owner of the loom. It is interest; and, as it is exchanged for consumers' goods, it helps to maintain the capitalist. In a static state this income would be wholly consumed by the capitalist, and no more wealth would be so used. The capital would remain intact. This means that exactly the

amount of cloth that is available for making good the wear of the loom is received, as this waste takes place, by the men who make the restoration.

Now, who has any occasion to compute the period marked by the life of this instrument for the purpose of making a discount on future goods? The end of the period brings no good thing to the owner or user. If he has let the surplus earnings of the machine accumulate, as a sinking fund for buying another, the time when he draws this fund from the bank means no new enjoyment for him. It is a self-renewing time for the instrument. Its accumulated earnings take the shape of a successor in the definite series of instruments that, in its entirety, constitutes a bit of permanent capital. The only thing the owner looks forward to with anticipation of enjoyment is the unending series of other earnings that come to him, not from this machine only, but from the whole series; and that succession of earnings constitutes permanent interest.

In our formulas this is saying that the owner looks only for perpetual products from permanent capital. The length of the period before the self-renewing time of a particular instrument is, to him, of no consequence.

The men who replace the loom get their rewards daily, as their work proceeds. Indirectly, they are making some of the cloth on which the loom that is in use is spending and exhausting itself. In a true sense, though not in a literal one, the machine makes a new machine; and in a true sense the builders of the new machine make cloth. The actions and their fruits are synchronous.

Would a lengthening of the period mean a greater output of consumers' goods? Tools and machines differ in the frequency with which they require renewal, without differing in net productive power. Side by side may be seen a mill driven by water power and another driven by a steam-engine. The dam, race, wheel-pit, etc., may be

so solidly built as to last almost indefinitely; while the engine and boilers may have to be renewed after twenty-five years. If they are both in use, it is clear that, as a commercial fact, they must both pay interest on the permanent capital that they represent. If each has cost a hundred thousand dollars, and if in each case the investment is a judicious one, then each pays to its owner a net amount of about five thousand dollars a year. The hydraulic plant does not need to earn a gross sum that much exceeds this. The complete renewal of the plant is a necessity too remote to figure largely in the calculation. The steam plant must yield, besides the interest, about four per cent. a year for self-renewal. It creates a twenty-fifth of its own monetary value every year, in addition to the five per cent. that is interest.

Now, it would be possible to substitute dams and reservoirs for engines without changing the productivity of industry; but the change would greatly lengthen the periods of production. An engine will ripen into woollen cloth within twenty years after it is set running; while the dam will not so ripen within any period of which we take account.

In making this change, we alter neither the amount of the returns that the industry yields nor the dates at which the returns are received. In both cases the rewards come day by day, as the work proceeds. In the case of the dam there is little waste of what we have called the tissue of capital, and there is little labor spent in restoring the waste. The dam does not wear out with any rapidity. In the case of the engine there is much waste of tissue, and much industry is spent in renewing it. The engine creates more consumers' goods than does the dam; and this excess, coming as it does day by day, pays the men who are in the meanwhile building a new engine.

The engine-builders are daily creating woollen cloth indirectly, by replenishing the tissue of the plant that is

wearing itself out. Substitute a dam for the engine, and you release most of these men from the making of instruments, and allow them to create directly the cloth that they formerly made by the indirect process. In both cases they get it daily, as they work. Formerly they got it as they themselves worked day by day in the machine shop, while the engine worked for them in the mill. Now they get it as they directly work in the mill.

This illustration could be elaborated, and made to resemble the complicated facts of life. What is clear is that the periods of production marked by the ripening time of particular capital goods may be lengthened or shortened without affecting the productivity of industry.

One thing only will produce the effects that in Professor v. Böhm-Bawerk's study are connected with this lengthening of the intervals. It is the creation of an instrument that does not replace another, but constitutes a net addition to the capital of society. Build an altogether new engine. That is creating capital. Renewing an old one is only preserving capital.

Does the making of the new engine lengthen a period of production? It is rather the beginning of an entirely new series of periods. It does not affect the periods that are measured by the duration of other engines, etc. Does it lengthen the average of all the periods? That depends on the question whether the duration of an engine is greater or less than the average duration of all other instruments. It is possible to add to the total capital of society by making a short-time tool, which will wear itself out in a week. It will of course create its own successor within that time, in the indirect way that we have noted; and the creation of this series of short-time tools has the effect of permanently reducing the average of all the periods of production.

Is the creation of such a series equivalent to the selection of a roundabout mode of production? Does it divert

industry from a direct line? With careful qualifications we may say yes.* The entrepreneur who uses the tool imports into his industry the result of the work of the tool-maker. This latter work contributes indirectly to the entrepreneur's product.

Why is the indirect process fruitful? Is it because of its indirectness, or of the extra time that, in the first stage, it requires? Clearly not. The only cause of enlarged fruit is the tool itself. The reason why the enlargement is perpetual is that the series of tools secured is an endless

*The roundabout route does not take the capitalist himself to the same goal that he would have reached by the direct route.

In the simplest of Professor v. Bohm-Bawerk's illustrations a man chooses between gathering fire-wood with his hands or making a hatchet wherewith to cut wood. The latter is an indirect process, and is more fruitful than the former one; but the result of both processes is fire for the man's use. Here are two routes to the same personal goal. Is this the choice offered to the capitalist? He might have gathered wood, or caught fish, or built huts for his personal use. In a typical case he actually makes a hatchet that, in the hands of others, cuts wood enough to indirectly replace itself, and yields a perpetual surplus of wood to its user. As this is sold, the returns are paid, in money, to the owner of the capital, and enable him or his heirs to enjoy a perpetually enlarged income. This income is used for buying things quite unlike the fuel, the fish, or the huts that the original capitalist might have bought, had he not practised abstinence. *To the capitalist* saving is not a choosing between direct and indirect routes to the same personal goal. It is a choosing between wholly different goals.

To the capitalist, also, saving involves no waiting for the fruits of his original labor. In the illustration the man chooses a hatchet instead of a hut; and he gets the one as early as he would have gotten the other. Even the man who "abstains" does not wait for his *income*. He chooses to take, as a part of his income, an instrument that has a self-renewing power, and that thus becomes the first in an endless succession of instruments. For the further products that will come through the use of this series of instruments there is, of course, waiting to be done, just as there is waiting to be done before the rewards of future labor will be realized. The essential fact in the case is that the industry that secured the new series of capital goods does not have to wait for its income, *in the form in which it chooses to take that income*. For the *income from the income* there is waiting to be done.

In this latter waiting the period of production measured by the working lifetime of the implement ceases to be of consequence The wood that has to be used in replacing the hatchet is not for the capitalist, and it is of no importance to him how often these tools have to be replaced. That the series shall yield its perpetual surplus, above the cost of replacement, is the result for which he cares.

one. Abstinence has put into action a wholly new series of instruments, every one of which makes the hand of the worker more efficient. Perpetual efficiency in creating goods results from the unending series of implements secured by saving. In our terms a new unit is added to permanent capital; and this is the cause of the increased fruitfulness of industry.*

The study of capital goods leads to the study of permanent capital. The study of intervals of time reveals the mechanism by which capital becomes permanent. It shows that the intervals do not impose time sacrifices, and that the only waiting that is burdensome is that perpetual waiting, or definitive foregoing of pleasure, that is called abstinence. It shows that permanent capital, and not the time that it takes originally to create it, is the cause of interest. This income is called into existence by the action of the endless series of capital goods. Through the study of capital goods and their periods of production we may reach a theory of capital and its continuous production. As the capital, and not the time required for creating and using it, is the cause of the product that takes the form of interest, so changes in the amount of capital itself, and not a lengthening or shortening of productive periods, are the causes that affect the rate of interest. Make the social fund larger, and you make the rate of interest smaller. Unless you thus increase the fund, you may manipulate the productive periods as you will without affecting this rate. A study of capital goods and of their periods of production can therefore solve the

* The question whether creating more goods involves creating more value has of course to be settled. It would unduly prolong this paper to discuss that question here. In my view, interest is based on the *specific productivity* of capital. It is fixed by the amount of wealth, measured in units, that the final increment of social capital, separately considered, creates. The goods that are specifically attributable to a single unit of social capital necessarily represent a value. The issue raised by citing the fact that, as an aggregate of goods becomes larger, the value per unit becomes smaller, does not affect the validity of a theory based on the specific productivity of capital

interest problem only as it leads to a study of that permanent social agent which creates the income that is called interest. It may lead by a new and interesting route to a theory of capital and its product. Large indeed are the scientific fruits to be secured by following this route, if only it be followed to the end.

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